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| EXAMINER | |
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| DEAN, RAYMOND S | |

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**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

| Office Action Summary | Application No. | Applicant(s) | |
|---|---|---|---|
| | 10/720,658 | TERRY ET AL. | |
| | Examiner | Art Unit | |
| | RAYMOND S. DEAN | 2618 | |

*-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --*

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

1)☒ Responsive to communication(s) filed on *12 January 2009*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

4)☒ Claim(s) *1-10,12-29,31-34,36-39 and 41-44* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-10,12-29,31,33,34,36,38,39,41,43 and 44* is/are rejected.

7)☒ Claim(s) *32,37 and 42* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

**Application Papers**

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *15 March 2004* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

## DETAILED ACTION

### *Response to Arguments*

1. Applicant's arguments, see pages 11 – 13 of Applicants' remarks filed January 12, 2009 with respect to the rejection(s) of claim(s) 1 under 35 U.S.C. 103(a) have been fully considered and are persuasive. Therefore, the rejection has been withdrawn. However, upon further consideration, a new ground(s) of rejection is made in view of newly found prior art Boariu et al. (US 6,865,237).

Boariu, which also teaches a multiple antenna system that uses Space Time Block Coding (STBC), teaches the wherein an apparatus is **configured to** form a composite code from each of the layers of a code (Col. 27 lines 35 - 37, this shows that the system of Boariu has the capability to add any layers to a code thus rendering a scenario wherein each layer is added to the code thus forming a composite code, Applicants have only claimed an apparatus that is set up to/or has the capability to form the composite code via the use of the phrase "configured to" as opposed to actually forming said composite code).

### *Claim Rejections - 35 USC § 103*

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

3. Claims 1 – 10, 16 – 17, and 21 – 23, 30 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kadous (US 6,636,568) in view of Thielecke et al. (US 2003/0003863) and in further view of Boariu et al. (US 6,865,237)

Regarding Claims 1, 16, 21, Kadous teaches an apparatus/method comprising: a first mapper adapted to receive first representations of a first portion of the communication data (Figure 5, Col. 16 lines 1 – 52), said first mapper for mapping the first representations of the first portion of the communication data into first mapped values according to a first mapping scheme (Figure 5, Col. 16 lines 1 – 52, See Also Response To Arguments set forth in the Office Action dated February 22, 2008); a second mapper adapted to receive second representations of a second portion of the communication data (Figure 5, Col. 16 lines 1 – 52), said second mapper for mapping the second representations of the communication data into second mapped values according to a second mapping scheme (Figure 5, Col. 16 lines 1 – 52, See Also Response To Arguments dated February 22, 2008), the second mapping scheme exhibiting a mapping property that differs with the first mapping scheme (Figure 5, Col. 16 lines 1 – 52), wherein the first mapper transmits the first mapped values to a first antenna transducer among a plurality of antenna transducers and wherein the second mapper transmits the second mapped values to a second antenna transducer among the plurality of antenna transducers (Figure 5, Cols. 15 lines 57 – 67, 16 lines 1 – 67, 17 lines 1 – 15, See Also Response To Arguments dated February 22, 2008), the first and second antenna transducers receive and transduce only the first mapped values and

the second mapped values, respectively, into electromagnetic form for communication upon the communication channel (Figure 5, Cols. 15 lines 57 – 67, 16 lines 1 – 67, 17 lines 1 – 15).

Kadous does not teach wherein the wherein the apparatus defines/means for defining a code comprising a plurality of layers defined over the first antenna transducer and the second antenna transducer and wherein the apparatus is configured to form a composite code from each of the layers of the code.

Thielecke, which also teaches a MIMO system that employs diversity, teaches wherein the apparatus defines a code comprising a plurality of layers defined over the first antenna transducer and the second antenna transducer (Section 0055, STBC enables a plurality of layers to be defined over a plurality of antennas).

It would have been obvious to one of ordinary skill in the art at the time the invention was made use the above feature of Thielecke in the system of Kadous as an alternative means for achieving the predictable result of diversity.

Boariu, which also teaches a multiple antenna system that uses Space Time Block Coding (STBC), teaches the wherein an apparatus is **configured to** form a composite code from each of the layers of a code (Col. 27 lines 35 - 37, this shows that the system of Boariu has the capability to add any layers to a code thus rendering a scenario wherein each layer is added to the code thus forming a composite code, Applicants have only claimed an apparatus that is set up to/or has the capability to form the composite code via the use of the phrase “configured to" as opposed to actually forming said composite code).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the system of Kadous in view of Thielecke with the above feature of Boariu for the purpose of providing power-balance space-time codes as taught by Boariu.

Regarding Claims 2, 22, Kadous in view of Thielecke and in further view of Boariu teaches all of the claimed limitations recited in Claims 1, 21. Kadous further teaches a first encoder adapted to receive the first portion of the communication data, said first encoder for encoding the first portion of the communication data according to a first encoding techniques (Figure 5, Col. 16 lines 21 – 23) and wherein the first representations of the first portion of the communication data to which said first mapper is adapted to receive comprise first-encoded values formed by said first encoder (Figure 5, Col. 16 lines 21 – 52).

Regarding Claims 3, 23, Kadous in view of Thielecke and in further view of Boariu teaches all of the claimed limitations recited in Claims 1, 21. Kadous further teaches a second encoder adapted to receive the second portion of the communication data, said second encoder for encoding the second portion of the communication data according to a second encoding technique (Figure 5, Col. 16 lines 21 – 23) and wherein the second representations of the second portion of the communication data to which said second mapper is adapted to receive comprise second-encoded values formed by said second encoder (Figure 5, Col. 16 lines 21 – 52).

Regarding Claim 4, Kadous in view of Thielecke and in further view of Boariu teaches all of the claimed limitations recited in Claim 1. Kadous further teaches

wherein the first mapped values into which said first mapper maps the first representations of the first portion of the communication data comprises a first set of mapped values, wherein the second mapped values into which said second mapper maps the second representations of the second portion of the communication data comprise a second set of mapped values, elements of the first set of mapped values differing in value with elements of the second set of mapped values (Col. 16 lines 36 – 52, the modulation schemes are different thus the constellations that correspond to said schemes are different which means that the symbol values that make up said constellations are different).

Regarding Claim 5, Kadous in view of Thielecke and in further view of Boariu teaches all of the claimed limitations recited in Claim 4. Kadous further teaches wherein the first set of mapped values and the second set of mapped values formed by said first mapper and said second mapper, respectively, are formed of mutually-exclusive elements (Col. 16 lines 36 – 52, the modulation schemes are different thus the constellations that correspond to said schemes are different which means that the symbol values that make up said constellations are different, since the symbol values are different there is mutual exclusivity, See Also Response To Arguments dated February 22, 2008).

Regarding Claim 6, Kadous in view of Thielecke and in further view of Boariu teaches all of the claimed limitations recited in Claim 4. Kadous further teaches wherein the mapping property exhibited by the second mapping scheme that differs with that of the first mapping scheme comprises vector magnitudes that differ (Col. 16

lines 36 – 52, the modulators can use a plurality of modulation/mapping schemes thus a first modulator can use a modulation/mapping scheme that differs from the modulation/mapping scheme of a second modulator said modulation schemes will have differing constellations and thus differing vector magnitudes).

Regarding Claim 7, Kadous in view of Thielecke and in further view of Boariu teaches all of the claimed limitations recited in Claim 1. Kadous further teaches wherein the first mapped values into which said first mapper maps the first representations of the first portion of the communication data comprise a first set of mapped values that exhibits first geometric differences there between, wherein the second mapped values into which said second representations of the second portion of the communication data comprise a second set of map values that exhibit second geometric differences there between (Col. 16 lines 36 – 52, the modulators can use a plurality of modulation/mapping schemes thus a first modulator can use a modulation/mapping scheme that differs from the modulation/mapping scheme of a second modulator, said modulation schemes will have differing constellations and thus differing vector magnitudes, since the constellations differ the geometric differences between the values or states of the first constellation will differ from the geometric differences between the values or states of the second constellation).

Regarding Claim 8, Kadous in view of Thielecke and in further view of Boariu teaches all of the claimed limitations recited in Claim 7. Kadous further teaches wherein the first geometric differences between the mapped values of the first set and the second geometric differences between the mapped values of the second set are

mutually exclusive (Col. 16 lines 36 – 52, since the constellations differ the geometric differences between the values or states of the first constellation will differ from the geometric differences between the values or states of the second constellation, since said geometric differences are associated with mapped values that are mutually exclusive the geometric differences will be mutually exclusive).

Regarding Claim 9, Kadous in view of Thielecke and in further view of Boariu teaches all of the claimed limitations recited in Claim 7. Kadous further teaches wherein the mapping property exhibited by the second mapping scheme that differs with that of the first mapping scheme comprises second geometric differences that differ in lengths with lengths of the first geometric differences (Col. 16 lines 36 – 52, since the constellations differ the geometric differences between the values or states of the first constellation will differ from the geometric differences between the values or states of the second constellation, said geometric properties comprise lengths thus the lengths will differ).

Regarding Claim 10, Kadous in view of Thielecke and in further view of Boariu teaches all of the claimed limitations recited in Claim 1. Thielecke further teaches defining a layered code having combined values that are applied to a respective one of the plurality of antenna transducers (Cols. 10 lines 64 – 67, 11 lines 1 – 6, the space-time code enables a layered code having combined values).

Regarding Claim 17, Kadous in view of Thielecke and in further view of Boariu teaches all of the claimed limitations recited in Claim 16. Kadous further teaches transducing the selected first mapped values and the selected second mapped values

applied during said operation of selectably applying into electromagnetic form and delivering, by way of the communication channel, the selected first and second mapped values, respectively, to the receiving station (Figure 6, Col. 17 lines 53 – 62).

Regarding Claim 24, 26, Kadous in view of Thielecke and in further view of Boariu teaches all of the claimed limitations recited in Claims 1, 21. Kadous further teaches wherein the first mapping scheme generates a first constellation set comprising a first plurality of symbol points (Col. 16 lines 1 – 52) and wherein the second mapping scheme generates a second constellation set comprising a second plurality of symbol points (Col. 16 lines 1 – 52), wherein a first distance between each of the first plurality of symbol points is different from a second distance between each of the second plurality of symbol points (Col. 16 lines 1 – 52, the distance between each of the symbol points in a 64 QAM constellation is different from the distance between each of the symbol points in a QPSK constellation).

Regarding Claim 25, Kadous in view of Thielecke and in further view of Boariu teaches all of the claimed limitations recited in Claims 16. Kadous further teaches wherein prior to transmitting only the first mapped values, generating, according to the first mapping scheme, a first constellation set comprising a first plurality of symbol points (Col. 16 lines 1 – 52) and generating, according to the second mapping scheme, a second constellation set comprising a second plurality of symbol points (Col. 16 lines 1 – 52), wherein a first distance between each of the first plurality of symbol points is different from a second distance between each of the second plurality of symbol points( Col. 16 lines 1 – 52, the distance between each of the symbol points in a 64 QAM

constellation is different from the distance between each of the symbol points in a QPSK constellation).

4. Claims 12 – 15 and 18 – 20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kadous (US 6,636,568) in view of Thielecke et al. (US 2003/0003863) in view of Boariu et al. (US 6,865,237), as applied to Claims 1, 17 above, and further in view of Ketchum (US 6,731,668).

Regarding Claims 12, 18, Kadous in view of Thielecke and in further view of Boariu teaches all of the claimed limitations recited in Claims 1, 17. Kadous further teaches a receiving station comprising: a decoder, which exploits the difference in mapping properties between the first and second mapped values (Figure 8A, the decoder (836a) decodes the first set), configured to receive indications of the communication data communicated upon the communication channel and delivered to the receiving station (Figure 6, Col. 18 lines 26 – 30, lines 45 – 47).

Kadous in view of Thielecke and in further view of Boariu does not teach a maximum likelihood decoder, which exploits the difference in mapping properties between the first and second mapped values, configured to receive indications of the communication data communicated upon the communication channel and delivered to the receiving station, said maximum likelihood decoder configured to determine a maximum likelihood path that defines selection of values of the communication data, the maximum likelihood path selected from amongst a set of possible paths, each defining communication data value possibilities.

Ketchum teaches a maximum likelihood decoder for determining a maximum likelihood path that defines selection of values of the communication data, the maximum likelihood path selected from amongst a set of possible paths, each defining communication data value possibilities (Column 3 lines 19 – 26, Column 8 lines 45 – 60).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the receiver of Kadous in view of Thielecke and in further view of Boariu with the Viterbi decoder of Ketchum as an alternative means of decoding a received signal thus providing an information sequence with a minimal number of errors as taught by Ketchum.

Regarding Claim 13, Kadous in view of Thielecke in view of Boariu and in further view of Ketchum teaches all of the claimed limitations recited in Claim 12. Ketchum further teaches wherein the set of possible paths from amongst which said maximum likelihood decoder selects the maximum likelihood path comprises fewer than all of the possible paths (Column 3 lines 19 – 26).

Regarding Claims 14, 20, Kadous in view of Thielecke in view of Boariu and in further view of Ketchum teaches all of the claimed limitations recited in Claims 12, 19. Ketchum further teaches wherein the set of possible paths from amongst which said maximum likelihood decoder selects the maximum likelihood path is selected responsive to a mapping scheme pursuant to which a mapper maps representations (Column 3 lines 19 – 26). Kadous further teaches a first and second mapping scheme (Figure 5, Col. 16 lines 1 – 52).

Regarding Claims 15, Kadous in view of Thielecke in view of Boariu and in further view of Ketchum teaches all of the claimed limitations recited in Claims 14. Ketchum further teaches wherein the set of possible paths from amongst which said maximum likelihood decoder selects the maximum likelihood path is selected responsive to a mapping scheme pursuant to which a mapper maps representations (Column 3 lines 19 – 26). Kadous further teaches a first and second mapping scheme (Figure 5, Col. 16 lines 1 – 52).

Regarding Claim 19, Kadous in view of Thielecke in view of Boariu and in further view of Ketchum teaches all of the claimed limitations recited in Claim 18. Ketchum further teaches prior to said operation of decoding, of selecting the set of possible paths from which the maximum likelihood path is formable (Column 3 lines 19 – 26).

5. Claims 27 – 29 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kadous (US 6,636,568) in view of Thielecke et al. (US 2003/0003863) in view of Boariu et al. (US 6,865,237), as applied to Claims 1, 16, 21 above, and further in view of Kammoun et al. (2003 4th IEEE Workshop on Signal Processing Advances in Wireless Communications).

Regarding Claim 27 – 29, Kadous in view of Thielecke in view of Boariu teaches all of the claimed limitations recited in Claims 1, 16, 21. Kadous in view of Thielecke in view of Boariu does not teach wherein the first mapping scheme comprises a spherical modulation scheme and wherein the second mapping scheme comprises a lattice modulation scheme.

Kammoun teaches a spherical modulation scheme and a lattice modulation scheme (Figure 3, Page 509, Sections 5.1, 6 lines 1 – 2).

Kadous in view of Thielecke in view of Boariu and Kammoun teach a wireless system in which digital modulation is used in order to transmit information thus it would have been obvious to one of ordinary skill in the art at the time the invention was made to use the above modulations of Kammoun as an alternative means for achieving the same predictable result of using digital modulation in order to transmit information.

6. Claims 31, 36, 41 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kadous (US 6,636,568) in view of Thielecke et al. (US 2003/0003863) in view of Boariu et al. (US 6,865,237), as applied to Claims 1, 16, 21 above, and further in view of Whang et al. (US 7,292,644)

Regarding Claims 31, 36, 41, Kadous in view Thielecke in view of Boariu teaches all of the claimed limitations recited in Claims 1, 16, 21. Kadous in view of Thielecke in view of Boariu does not teach wherein a first layer of the code comprises a concatenated space time block code (STBC) and a trellis code.

Whang, which also teaches a wireless system that uses diversity, teaches wherein a first layer of the code comprises a concatenated space time block code (STBC) and a trellis code (Col. 7 Lines 62 – 67).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the system of Kadous in view of Thielecke in view of

Boariu with the feature of Whang for the purpose of maximizing diversity gain as taught by Whang.

7. Claims 33, 38, 43 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kadous (US 6,636,568) in view of Thielecke et al. (US 2003/0003863) in view of Boariu et al. (US 6,865,237), as applied to Claims 1, 16, 21 above, and further in view of Wu et al. (US 7,103,326)

Regarding Claims 33, 38, 43, Kadous in view Thielecke in view of Boariu teaches all of the claimed limitations recited in Claims 1, 16, 21. Kadous in view of Thielecke in view of Boariu does not teach wherein the apparatus sums a first layer and a second layer of the code generating full diversity at the first and second antenna transducers.

Wu, which also teaches a wireless system that uses diversity, teaches wherein the apparatus sums a first layer and a second layer of the code generating full diversity at the first and second antenna transducers (Col. 1 lines 48 – 53).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to use the above feature of Wu as an alternative means for achieving the predictable result of diversity.

8. Claims 34, 39, 44 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kadous (US 6,636,568) in view of Thielecke et al. (US 2003/0003863) in view of Boariu et al. (US 6,865,237) in view of Wu et al. (US 7,103,326), as applied to Claims 33, 38, 43 above, and further in view of Li et al. (US 2004/0022183)

Regarding Claims 34, 39, 44, Kadous in view Thielecke in view of Boariu and in further view of Wu teaches all of the claimed limitations recited in Claims 33, 38, 43. Kadous in view Thielecke in view of Boariu and in further view of Wu does not teach wherein the first layer of the code comprises a low modulus property that is utilized by a receiver to generate a maximum likelihood path defining selection of values of the first and second set of values.

Li, which also teaches wireless system that uses diversity, teaches wherein the first layer of the code comprises a low modulus property that is utilized by a receiver to generate a maximum likelihood path defining selection of values of the first and second set of values (Sections 0006 lines 1 – 4, 0025 lines 1 – 7).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to use the above feature in Li as an alternative means for achieving the predictable result of diversity.

### *Allowable Subject Matter*

9. Claims 32, 37, 42 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

The following is a statement of reasons for the indication of allowable subject matter:

The prior art of record fails to teach of show the feature of wherein **a second layer of the code comprises a concatenated space time block code (STBC) formed by spherical modulation**.

***Conclusion***

10. Any inquiry concerning this communication or earlier communications from the examiner should be directed to RAYMOND S. DEAN whose telephone number is (571)272-7877. The examiner can normally be reached on Monday-Friday 6:00-2:30.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Edward F. Urban can be reached on 571-272-7899. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Raymond S Dean/
Examiner, Art Unit 2618
Raymond S. Dean
March 12, 2009